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BULLETIN

OF THE

TORREY BOTANICAL CLUB

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The Hepaticae of Bermuda

Alexander William Evans

(WITH PLATE 6)

Very little has been published on the hepatic flora of Bermuda. A short list by Mitten,* which appeared over twenty years ago, and a few scattered references of later date apparently include everything. In Mitten's list only six species are recorded. These were all collected by Mr. H. N. Moseley, one of the botanists of the Challenger Expedition, although one of the species noted had been previously found by Governor Lefroy. They are listed under the following names: *Aneura palmata*, *Cephalozia connivens*, *Dumortiera hirsuta*, *Otiona Aitonia*, *Pleuroschisma prostratum* and *Radula pallens*. Of these species the *Aneura* (or *Riccardia*) *palmata* is marked with an interrogation-point, the determination having been based on poor and sterile material. Since *R. palmata* is a species with a distinctly northern distribution, it would hardly be expected in Bermuda and is therefore omitted from the list which follows. It is possible that the specimens in question ought to have been referred to *R. latifrons* instead. Of the remaining five species two require a word of explanation. *Pleuroschisma prostratum* is of course a synonym of *Odontoschisma prostratum*, and Dr. M. A. Howe kindly reports that the sterile specimens of *Otiona Aitonia* preserved at Kew really represent the common *Reboulia hemisphaerica*. These five species have all been brought from Bermuda by later collectors.

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* Challenger Rep. Botany 1^2: 92, 93. 1884. — The same list, with the exception of *Radula pallens*, was originally published by Mitten in Jour. Linn. Soc. Bot. 15: 61. 1876.

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Within the past few years three additional species have been recorded. Two of these, *Cephalozia divaricata* and *Telaranea nematodes*, are mentioned by Howe, who also confirms the presence of *Cephalozia connivens* on the Island.* The third species, *Cololejeunea Jooriana*, is noted by the writer.† Eight hepatics in all, therefore, according to the published records, are satisfactorily known from Bermuda.

The present paper is based on six recent collections and increases the number of known species to twenty-three. These collections are as follows: 1. Four species, found by Professor W. G. Farlow in January 1900; 2. Nineteen species, found by Dr. M. A. Howe in July 1900; 3. Five species, found by Mrs. Helen M. Norcross in 1901; 4. One species, found by Professor W. R. Coe in 1903; 5. One species, found by Miss L. DeF. Haynes in 1903; and 6. Fifteen species, found by Mrs. N. L. Britton in 1905. Although it is probable that other species remain to be discovered, these collections doubtless include most of the conspicuous forms and give a fairly complete representation of the hepatic flora as a whole.

MARCHANTIACEAE

1. REBOULIA HEMISPHAERICA (L.) Raddi. Without definite locality (*Moseley*). On stone walls (*Farlow*). On stones in a cemetery, Hamilton (*Howe*). On shaded walls, Hamilton and Paget Parish (*Howe*). Paynter's Vale (*Mrs. Norcross*). Roadside bank, North Side (*Mrs. Britton*).

2. LUNULARIA CRUCIATA (L.) Dumort. At base of walls, Hamilton (*Howe*).

3. DUMORTIERA HIRSUTA (Sw.) Nees. Without definite locality (*Moseley*). On rocks, Church Cave (*Howe*, *Mrs. Britton*).

4. MARCHANTIA POLYMORPHA L. Without definite locality (*Miss Haynes*).

METZGERIACEAE

5. RICCARDIA LATIFRONS Lindb. Devonshire Marsh (*Howe*, *Mrs. Britton*).

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* Bull. Torrey Club **29**: 282, 286. 1902.

† Mem. Torrey Club **8**: 174. 1902.

6. RICCARDIA MULTIFIDA (L.) S. F. Gray. Devonshire Marsh (*Mrs. Britton*).

7. METZGERIA CONJUGATA Lindb. On rocks, Church Cave (*Howe*). Walsingham (*Mrs. Norcross*). The specimens are all sterile, and the determination is therefore somewhat doubtful.

8. PALLAVICINIA LYELLII (Hook.) S. F. Gray. Devonshire Marsh (*Farlow, Howe, Mrs. Britton*). Paget Marsh (*Mrs. Britton*).

JUNGERMANNIACEAE

9. PLAGIOCHILA SMALLII Evans. In a cave, Paynter's Hill (*Howe*). Paynter's Vale (*Mrs. Britton*).

10. CEPHALOZIA CONNIVENS (Dicks.) Lindb. Without definite locality (*Moseley*). Devonshire Marsh (*Howe, Mrs. Britton*).

11. CEPHALOZIA DIVARICATA (Sm.) Dumort. Devonshire Marsh (*Farlow, Howe*).

12. ODONTOSCHISMA PROSTRATUM (Sw.) Trevis. Without definite locality (*Moseley*). Devonshire Marsh (*Howe, Mrs. Britton*).

13. KANTIA TRICHOMANIS (L.) S. F. Gray. On old stump of *Osmunda*, Devonshire Marsh (*Mrs. Britton*).

14. TELARANEA NEMATODES (Gottsche) M. A. Howe. Devonshire Marsh (*Howe*).

15. RADULA PALLENS (Sw.) Nees. Without definite localities (*Lefroy, Moseley*). On rocks, Church Cave (*Howe, Mrs. Britton*). On rocks in a cave, Paynter's Hill (*Howe*). Walsingham and Paynter's Vale (*Mrs. Norcross*).

16. COLOLEJEUNEA JOORIANA (Aust.) Evans. On trees, Paynter's Hill and Devonshire Marsh (*Howe*). A few specimens only.

17. COLOLEJEUNEA MINUTISSIMA (Sm.) Schiffn. On buttonwood, Devonshire Marsh (*Howe*). On *Celtis*, Walsingham Caves (*Mrs. Britton*).

18. LEJEUNEA GLAUCESCENS Gottsche. On stones, Walsingham (*Howe, Mrs. Norcross, Mrs. Britton*). On rocks, Church Cave (*Howe*). Gully, Tuckerstown (*Mrs. Britton*).

19. RECTOLEJEUNEA PHYLLOBOLA (Nees & Mont.) Evans. Devonshire Marsh (*Farlow*). On trees, Church Cave, Walsingham and Paynter's Hill (*Howe*). On sticks and shrubs, near Walsingham Caves (*Howe*). On trees, Walsingham Caves (*Mrs. Norcross, Mrs. Britton*).

20. EUOSMOLEJEUNEA OPACA (Gottsche) Steph. On trees and rocks, Paynter's Hill (*Howe*).

21. CROSSOTOLEJEUNEA BERMUDIANA sp. nov. (see description below). On the ground and on rocks, Flatts (*Coe*). Paynter's Vale (*Mrs. Britton*).

22. JUBULA PENNSYLVANICA (Steph.) Evans. Paynter's Hill (*Howe*). A few sterile fragments only, but apparently referable to this species.

23. FRULLANIA SQUARROSA (R. Bl. & N.) Dumort. On roots of mangrove, Walsingham (*Howe*). Cave, Paynter's Vale (*Mrs. Britton*).

It will be seen from the species listed that over 65 per cent. are *Jungermanniaceae* and that the others are equally divided between the *Marchantiaceae* and the *Metzgeriaceae*. The *Ricciaceae* are as yet unrepresented. Of the *Jungermanniaceae* more than half belong to the *Jubuleae*.

The flora on the whole is most closely related to that found in the eastern part of North America, thirteen species being common to Connecticut and the same number to Florida. At the same time it will be noted that twelve of the species occur in the British Isles and that about as many have been reported from the West Indies. If, however, species are excluded which are almost cosmopolitan, such as *Marchantia polymorpha* and *Reboulia hemisphaerica*, it will be found that the others are nearly all distinctly southern or even tropical in their distribution. The subtropical character of the flora is also illustrated by the relatively large number of the *Jubuleae*.

Crossotolejeunea bermudiana sp. nov.

Yellowish-green, varying to pale-green and becoming brownish with age, growing in depressed tufts: stems 0.08 mm. in diameter, prostrate and loosely adherent to the substratum, sparingly and irregularly branched, the branches widely spreading: leaves distant to loosely imbricated, the lobe widely spreading, more or less convex and sometimes inflexed at the apex, falcate, 0.5 mm. long, 0.4 mm. wide, outer portion broadly orbicular-ovate, abruptly dilated from a narrow basal region, antical margin straight or slightly incurved near the base, then strongly outwardly curved to the apex, arching partially or wholly across axis, postical margin also more or less curved, apex broad, usually abruptly acute or apiculate, whole margin (except close to the antical base) minutely crenulate from projecting cells; lobule ovoid, 0.17 mm. long, 0.1 mm. wide, inflated throughout, keel strongly arched, forming an angle of about 90° with the postical margin of lobe, free margin involute to beyond the apex, sinus straight to lunulate, apical tooth blunt and straight, bearing a hyaline papilla at its proximal base; cells of lobe averaging 17 μ at the margin, $25 \times 19 \mu$ in the middle and $35 \times 23 \mu$ at the base, more or less convex, walls thin, trigones and the rather numerous intermediate thickenings small but usually distinct, cuticle smooth, ocelli none: underleaves distant, orbicular, 0.15 mm. long, bifid about one half with erect, obtuse, acute or apiculate divisions and a narrow, acute or obtuse sinus, margin everywhere crenulate from projecting cells, sometimes obscurely and bluntly unidentate on the sides: inflorescence autoicous: ♀ inflorescence sometimes on a very short branch (with a single rudimentary leaf besides the bracts), sometimes on a leading branch, innovating on one side, rarely on both, the innovations usually sterile; bracts erect-spreading, the lobe ovate to obovate, 0.55 mm. long, 0.3 mm. wide, apex obtuse to acute or apiculate, margin sparingly and irregularly angular-dentate, otherwise crenulate, lobule ligulate, 0.4 mm. long, 0.08 mm. wide, mostly blunt at apex, crenulate; bracteole slightly connate on one side, ovate, 0.5 mm. long, 0.3 mm. wide, bifid about two fifths with erect and acute divisions separated by a narrow sinus, margin as in the bracts; perianth about half exserted, not compressed, oblong-obovoid from a somewhat narrowed base, 0.8 mm. long, 0.35 mm. in diameter, broad and truncate at the apex with a short beak, sharply five-keeled, the keels narrowly and obsoletely bialate in the upper part, the wings crenulate or denticulate from projecting cells, rarely with a few teeth two cells long in the apical region: ♂ inflorescence occupying a short branch; bracts in two or three pairs, closely imbricated, strongly inflated, slightly and subequally bifid with blunt to subacute divisions; bracteole present at base of spike, similar to the underleaves but smaller; antheridia in pairs: mature sporophyte not seen. (PLATE 6.)

The specimens from Flatts may be considered the type.

Except for the five-keeled perianth, this new species has much in common with the genus *Prionolejeunea*. The leaves, the leaf-cells and the underleaves are very similar, and the lobule is constructed on the same plan, bearing a hyaline papilla at the proximal base of the apical tooth; the latter, however, is straight instead of curved, and the papilla is in a distinct depression.

The genus *Crossotolejeunea* is largely if not wholly confined to the American tropics and includes about a dozen species. The type is *C. Boryana* (Mont.) Schiffn., which is of about the same size as *C. bermudiana* and which agrees with it also in its autoicous inflorescence. The leaves of *C. Boryana*, however, are more densely imbricated, the apex of the lobe is acuminate and usually reflexed, the leaf-cells are minutely verruculose, the apical cell of the lobule is more curved and can usually be seen without dissection, the underleaves are larger, with narrow acuminate divisions, sharply unidentate on the sides, the perichaetial bracts and bracteoles are usually more sharply toothed, and the wings of the perianth are spinose or incised-serrate.

C. paucispina (Spruce) Steph.,* a species first described from Brazil but afterwards recorded from Guadeloupe, is even more closely related. Through the kindness of Mr. M. B. Slater, of Malton, Yorkshire, the writer has been enabled to study a portion of the type material of this species from the Spruce herbarium. It agrees with *C. bermudiana* in general appearance and in most of the characters derived from the lobes, lobules and leaf-cells. It is, however, somewhat more robust, the leaves measuring about 0.75 mm. in length and the broadly orbicular underleaves about 0.25 mm. The leaf-cells also are a trifle larger and are very minutely verruculose, although described as smooth by Spruce. The underleaves are more deeply bifid, with acuminate and often connivent divisions, and the perianth is slightly compressed and only four-keeled, the antical face being plane. According to Spruce the keels bear a few deciduous spines in the upper part, but this could not be demonstrated in the material examined by the writer.

YALE UNIVERSITY.

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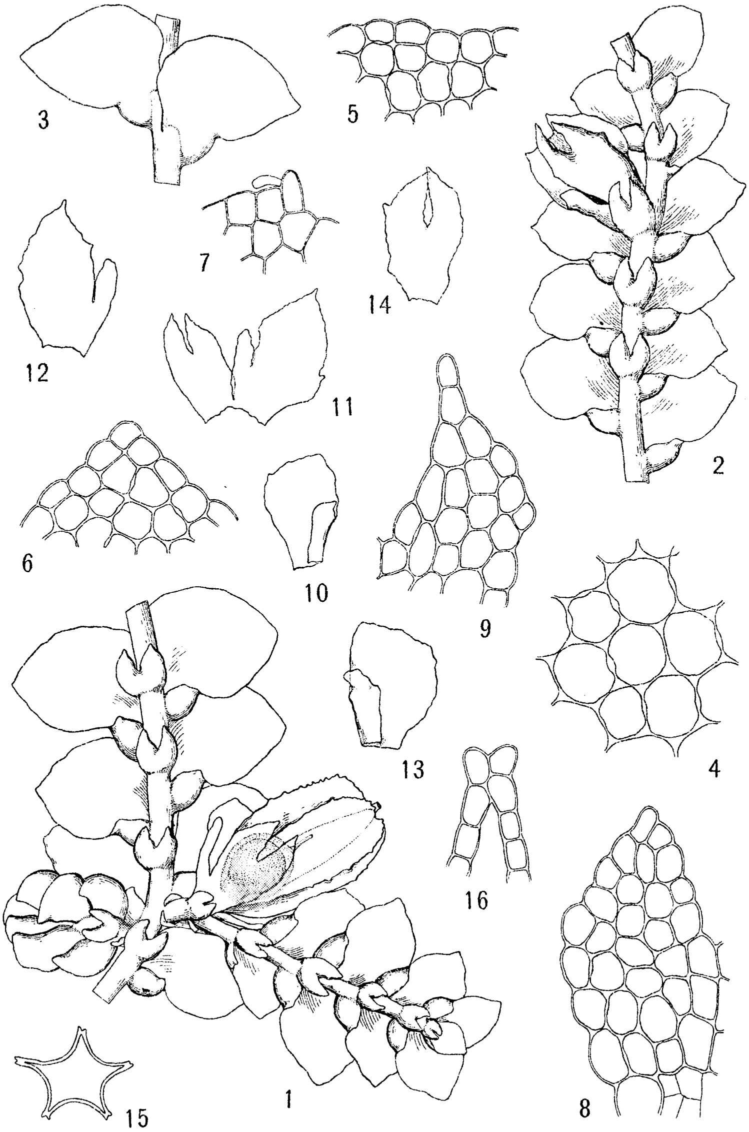
* Hedwigia 35: 76. 1896. (*Lejeunea paucispina* Spruce, Hep. Amaz. et And. 163. 1884).



CROSSOTOLEJEUNEA BERMUDIANA Evans

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Explanation of plate 6

Crossotolejeunea bermudiana Evans

FIG. 1. Part of plant showing male inflorescence and female branch with perianth and young sporophyte, postical view, × 40.

FIG. 2. Leading branch with female inflorescence, postical view, × 40.

FIG. 3. Two leaves, antical view, × 40.

FIG. 4. Cells from middle of lobe, × 300.

FIG. 5. Cells from antical margin of lobe, × 225.

FIG. 6. Apex of lobe, × 225.

FIG. 7. Apex of lobule, × 225.

FIGS. 8, 9. Apices of underleaf-divisions, × 225.

FIGS. 10, 11. Bracts and bracteole from the same involucre, × 40.

FIGS. 12–14. Bracts and bracteole from another involucre, × 40.

FIG. 15. Transverse section of perianth, × 40.

FIG. 16. Antical keel of perianth in transverse section, × 225.

The figures were all drawn by the writer from the type specimens, and prepared for publication by Miss Hyatt.